

***MODELING STUDY OF RELATIVE IMPORTANCE OF MACROPHYSICS AND
MICROPHYSICS IN DETERMINING CLOUD PROPERTIES***

S. Endo, Y. Liu, and W. Lin

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**Environmental Sciences Department/Atmospheric Sciences Division
Brookhaven National Laboratory**
P.O. Box, Upton, NY
www.bnl.gov

ABSTRACT

It has been well recognized that both macrophysics (e.g., lower tropospheric stability) and microphysics (e.g., droplet concentration) affect boundary layer clouds; however, their relative importance has not been well understood and quantified. For example, Lin et al. (2009) investigated the seasonal differences of mean properties of marine boundary-layer clouds off the California coast, and found that in comparison with wintertime clouds, the summertime clouds have a larger cloud fraction and liquid water path, lower cloud-top and cloud-base height, and similar cloud thickness and inversion strength. They found that most of these macrophysical features can be explained by the similarity to the downstream stratocumulus-to-cumulus transition theory. On the other hand, Liu (2010) showed that the same data exhibit striking microphysical differences between the summer and winter clouds, with the former having a higher liquid water content and cloud droplet concentration but smaller effective radius and drizzle rate. To discern the relative roles of macrophysics and microphysics, in this study, we perform idealized simulations using the LES mode of WRF model with a double-moment cloud microphysics scheme and vertical profiles from Lin et al. Extension of the results to the general boundary clouds such as those at the SGP site is explored.

This poster will be displayed at ASR Science Team Meeting.